

REMARKS/ARGUMENTS

The action by the Examiner of this application, together with the cited references, have been given careful consideration. Following such consideration, claims 1, 4 and 8 have been amended to more clearly define the patentable invention applicant believes is disclosed herein. Claim 15 has been added, and claims 2, 3, 7 and 9-14 have been cancelled. Claims 5 and 6 are unchanged by the present amendment. It is respectfully requested that the Examiner reconsider the claims in their present form, together with the following comments, and allow the application.

The Examiner has indicated that claims 6 and 14 recite allowable subject matter. In this regard, the Examiner notes that claims 6 and 14 would be allowable if rewritten in independent form to include all the limitations of the base claim and any intervening claims.

However, the Examiner has rejected the remaining claims (i.e., claims 1-5 and 7-13) as being unpatentable in view of multiple prior art references. In particular, claims 9-13 have been rejected as being anticipated by Wang et al. (U.S. Patent No. 6,489,035); claims 9-10 and 12 have been rejected as being anticipated by Konicek (U.S. Patent No. 4,503,112); claims 9-12 have been rejected as being anticipated by Ameen et al. (U.S. Patent No. 6,132,589); claims 1-4 and 7-12 have been rejected as being anticipated by Nakahara et al. (Journal Article); claim 13 has been rejected as being obvious in view of the combined teachings of Konicek and Schoerner et al. (German Patent Document No. DT 2435456) or Sturm (U.S. Patent No. 5,039,570); and claims 1-5 have been rejected as being obvious in view of the combined teachings of Nguyen et al. (U.S. Patent No. 5,689,227), Juergens et al. (European Patent Document No. EP 7598) and Sturm. The present invention relates to a resistor foil for use in forming embedded resistors in printed circuit boards. Broadly stated, the resistor foil includes a resistive copper foil and first and second layers of resistive material that are used in forming a resistive element of an embedded resistor.

Independent claim 1 now requires “an *oxide layer* having a thickness of between 5 Å and 70 Å on said first side of said copper layer.” Furthermore, claim 1 now defines the *first resistor metal* as “selected from the group consisting of aluminum, zinc, nickel,

nickel/chromium, nickel/chromium/aluminum/silicon alloy, titanium, vanadium, chromium, tantalum, iron, manganese and alloys, oxides, nitrides and silicides thereof,” and the *second resistor metal* as “selected from the group consisting of aluminum, zinc, nickel, nickel/chromium, nickel/chromium/aluminum/silicon alloy, titanium, vanadium, chromium, tantalum, iron, manganese and alloys, oxides, nitrides and silicides thereof.”

With regard to Wang et al. ‘035 discloses an embodiment of a sheet material comprised of a copper foil, a stabilization layer (i.e., zinc oxide, chromium oxide or a combination thereof), and a nickel/chromium/aluminum/silicon (Ni/Cr/Al/Si) alloy. Accordingly, Wang et al. ‘035 discloses (1) a copper layer, (2) an oxide layer and (3) a single resistor metal layer, whereas the claimed invention calls for (1) a copper layer (2) an oxide layer, (3) a first layer of a first resistor metal, and (4) a second layer of a second resistor metal.

Konicek discloses a product comprised of a carrier layer of copper, a thin layer of copper, and an intermediate metallic layer positioned between both layers of copper. The intermediate metallic layer is selected from the group consisting of nickel, a nickel-tin alloy, a nickel-iron alloy, lead, and a tin-lead alloy. Nowhere does Konicek teach or suggest the claimed “oxide layer.”

Ameen et al. disclose a treated copper foil comprised of a (1) copper foil, (2) a layer of zinc oxide on at least one side of the copper foil, and (3) a layer of a trivalent chromium oxide adhered to the layer of zinc oxide. Accordingly, Ameen et al. fail to teach or suggest a resistor foil having (1) a copper layer (2) an oxide layer, (3) a first layer of a first resistor metal, and (4) a second layer of a second resistor metal, as now required by independent claim 1. Furthermore, chromium oxide is not among the group of metals of the claimed “first resistor metal” and “second resistor metal.”

Nakahara et al. disclose alternating layers of copper/nickel. Accordingly, Nakahara et al. fail to teach or suggest the claimed “oxide layer.”

Juergens et al. teach a product comprised of the following layers: (1) a substrate (i.e., plastic film), (2) a nickel-chromium resistance layer, (3) a nickel-chromium oxide layer, (4) an intermediate layer (i.e., nickel, iron, or copper), and (5) a contact layer. Juergens et al. fails to

teach or suggest the claimed "oxide layer" having a thickness of between 5 Å and 70 Å *on said first side of said copper layer*, a first layer of a first resistor metal *formed directly on* the oxide layer, and a second layer of a second resistor metal *formed directly on* the first layer of the first resistor metal, as now defined by claim 1.

It is further submitted that neither Sturm, Nguyen et al., nor Schoener et al., taken individually or in combination, teach or suggest the invention as now defined by claim 1.

Newly added claim 15 defines a "resistor foil" including "an *oxide layer* having a thickness of between 5 Å and 70 Å on said first side of said copper layer." The oxide layer is further defined as comprising "an oxide of a metal selected from the group consisting of copper, zinc, nickel, palladium, titanium, tantalum, aluminum, iron, vanadium, chromium, chromium-based alloys and nickel-based alloys, and combinations thereof." Claim 15 also defines "a first layer of a first resistive material" and "a second layer of a second resistive material...wherein said first resistive material has a resistance different from said second resistive material, and at least one of said first layer of said first resistive material and said second layer of said second resistive material includes a material selected from the group consisting of aluminum, zinc, nickel, nickel/chromium, nickel/chromium/aluminum/silicon alloy, titanium, vanadium, chromium, tantalum, iron, manganese and alloys, oxides, nitrides and silicides thereof.

In view of the above discussion of the prior art, it is respectfully submitted that claim 15 is likewise patentable over the prior art references.

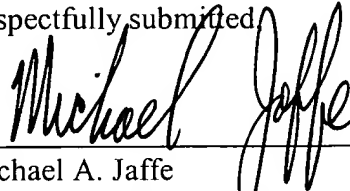
In view of the foregoing, it is respectfully submitted that the prior art references, taken individually or in combination, fail to teach or suggest the applicant's invention, as now defined by independent claims 1 and 15. Furthermore, it is respectfully submitted that the dependent claims are likewise patentable over the prior art.

It is respectfully submitted that the present application is now in proper condition for allowance. If the Examiner believes there are any further matters which need to be discussed in order to expedite the prosecution of the present application, the Examiner is invited to contact the undersigned.

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Reply to the Office Action mailed September 11, 2003
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If there are any fees necessitated by the foregoing communication, please charge such fees to our Deposit Account No. 50-0537, referencing our Docket No. GD7240US.CIP.

Respectfully submitted



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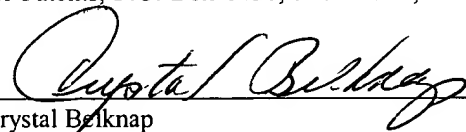
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